

1846; the other an "elementary sketch," written after the publication of his volume of "Lectures on Quaternions." He here again insists on the combination of the notions of time and space in the quaternion.

"And how the One of Time, of Space the Three  
Might in the Chain of Symbol girdled be."

The appendix also contains Hamilton's account of Mädler's attempt to show that the Pleiades are the central group of our sidereal system. The doctrine was unworthy of Hamilton's attention, and these pages are the only ones in this volume which we would gladly have seen omitted. Of infinitely more value are the remaining pages, in which we find a carefully compiled catalogue of all Hamilton's writings. There is also an interesting list of the chief unpublished manuscripts of Hamilton which have been preserved; and finally, before the capital index is reached, we have an enumeration, to which Prof. Tait has contributed, of the chief works of other mathematicians in which the quaternions have been employed.

It is impossible to read these volumes without acquiring a feeling of admiration amounting almost to reverence for the majestic intellect that they so adequately portray. In his youth Hamilton set before himself with deliberate aim the attainment of excellence in scientific work. Throughout his life he spared no pains, he flinched from no labour, to attain his ideal. With wonderful singleness and concentration he devoted his life to work. His career affords another illustration of the very close alliance if not actual identity between genius and the capacity for taking pains. If the quality of his work could not be surpassed, most assuredly its quantity could hardly be rivalled, and yet when we take leave of this work and ponder on the lessons it teaches it is perhaps hardly on the intellectual side of Hamilton's life that we shall find ourselves meditating. It is impossible to follow that exquisite correspondence between Hamilton and De Morgan without thinking of the rare but well-deserved good fortune which gave to De Morgan such a correspondent as Hamilton, which gave to Hamilton such a correspondent as De Morgan. On both sides these letters breathe a lofty spirit of truthfulness and honour and of attachment to whatsoever things are just and noble. Each shows a charming conception of the respect due to his friend and of the respect due to himself. Friendship such as these two men enjoyed was indeed a choice privilege. Hamilton shows himself not only as the consummate mathematician and philosopher, not only as the scholar and the poet, but as the high-minded gentleman with whom exalted conceptions of duty were habitual.

Finally, we must express our obligations to Mr. Graves for the admirable way in which he has completed his monumental task. He was intrusted with the preparation of the biography by Hamilton himself, and for laborious years he has devoted himself to the charge which his deceased friend laid upon him. Materials he had in abundance the most prodigal. He has selected copiously and he has selected judiciously, and he has told his wonderful story with a literary gracefulness that we most gratefully acknowledge. The memorable volumes of the "Lectures on Quaternions" and the "Elements of Quaternions" have a place on the shelves of all scientific libraries

which are worthy of the name. Beside them should be ranged the three portly volumes in which Graves has recounted the life of that astonishing genius by whom Quaternions were invented.

#### THE ENGLISH TRANSLATION OF WEISMANN'S "ESSAYS."

*Essays on Heredity and Kindred Biological Problems.*

By Dr. August Weismann. Authorized Translation,  
Edited by E. B. Poulton, Selmar Schönland, and  
Arthur E. Shipley. (Oxford: Clarendon Press, 1889.)

THIS is the fourth volume of a very useful series of translations of foreign biological memoirs, and the Delegates of the Clarendon Press are again to be congratulated on their choice of subject and editors.

As the editors' preface tells us, since Mr. Shipley's article, entitled "Death," in the *Nineteenth Century* for May 1885, first called the attention of English biologists to Prof. Weismann's essays, the interest in that author's conclusions and arguments has become very general. This interest has been stimulated and widened by the articles of various authors in *NATURE*, by Prof. Lankester's addresses at the Royal Institution, and, above all, by the great discussion introduced by Prof. Lankester at the meeting of the British Association in Manchester. No doubt a translation is superfluous, in these days of international science, to most biologists. But this is much more than a technical treatise on a technical subject. It is of interest to that far wider circle of readers and thinkers devoid of the time or the opportunity to wrestle with the involved German of the original. For to most the pith and kernel of the whole book is the criticism, perhaps the refutation, of the theory of the inheritance of acquired characters. That theory is of immediate importance to biology, but it is of equal, if remoter, importance to education and morality. We are certain that biologists do not enjoy a monopoly of education: we are by no means certain that they enjoy a monopoly of morality.

The translation is very accurate and unusually elegant: the foreign idiom has, to a large extent, been avoided, and there is little trace of the intricacies of Teutonic inversion. The footnotes are exceedingly useful, and many of them introduce important collateral matter. For instance, on p. 172, a concise and clear account is given of Mr. Francis Galton's earlier and somewhat parallel explanation of heredity.

The typography is excellent, but the absence of spaced type—a device of great utility in the original—is to be regretted.

The essays are translated in chronological order from the revised German editions. And so, by a consecutive perusal of the book, an historical conception of the wonderful series of inductions and inferences may be gained. Among the many converging lines of thought and work that led to the conception of the germ-plasma as the basis of heredity, two seem most clearly marked. In a prolonged study of the *Hydromedusæ*, Dr. Weismann discovered that the generative cells were formed only in certain localized areas. These special areas vary in position in different species, and the differences in position correspond to the different stages in a process of

displacement occurring in the phylogeny of the Hydroids. In the actual development these stages are repeated, and the primitive germ-cells migrate from the ancestral to the present position. From this it followed that the germ-cells contained something *sui generis*: something that could not be derived from the tissue-cells.

The first and third essays, on the other hand, show how a more or less theoretical consideration of death as a factor in biology led to the establishing of an actual continuity of life from individual to individual in genealogical series. In all animals above those consisting essentially of a single cell, this continuity of life is confined to the generative cells, and it is the other, or somatic, cells alone that are necessarily mortal.

Such converging lines led to the provisional hypothesis of a continuity of germ-plasma as the basis of heredity—the hypothesis in fact, to take a simple instance, that it is the eggs that have been forming the hens, and not the hens the eggs, and so with their ancestors from the remotest of times. With this new view came the discussion of the inheritance of acquired characters and the brilliant interpretations and investigations of parthenogenesis and polar bodies. Essay VII., on the supposed botanical proofs of the transmission of acquired characters—which has not before appeared in any form in English—and Essay VIII., on the supposed transmission of mutilations, are valuable contributions to the questions raised by the general theory.

There can be no doubt but that Dr. Weismann's essays will be for long a source of inspiration and stimulus to supporter and adversary, and this valuable translation must prove of great service in making better known what, if it never advances beyond the stage of a provisional hypothesis, has already been of the utmost service to biology.

P. C. M.

#### OUR BOOK SHELF.

*Chambers's Encyclopædia.* New Edition. Vol. IV. (London and Edinburgh: W. and R. Chambers, 1889.)

IN this volume of the new edition of "Chambers's Encyclopædia," subjects from "Dionysius" to "Friction" are dealt with. So far as we have been able to test it, we have found that the volume is in no respect inferior to its predecessors. The subjects include some that are of great scientific interest and importance, and these have been intrusted to writers whose names are a sufficient guarantee for the character of their work. Prof. Tait writes the article on force, Dr. W. Peddie those on energy and ether, and Prof. Cargill G. Knott that on electricity. Dynamos, the electric light, and the electric railway are described by Prof. J. A. Ewing. The theory of evolution is presented by Prof. Patrick Geddes, who, while expounding his own doctrine, tries to give a perfectly fair account of the opinions of thinkers with whom he only in part agrees. Dr. H. R. Mill has a good article on the earth, and Prof. James Geikie discourses with his usual clearness on Europe and on earthquakes. To the article on France, Prince Kropotkin contributes the geographical section. Prof. A. H. Keane is the author of the article on ethnology; and Dr. Henry Rink has a short but interesting paper on the Eskimo. These and other articles on scientific subjects in the present volume cannot fail to maintain the high reputation of "Chambers's Encyclopædia" for accuracy and thoroughness.

*Farm Live Stock of Great Britain.* By Robert Wallace, Professor of Agriculture at the University of Edinburgh. Second Edition. (Edinburgh: Oliver and Boyd. London: Simpkin, Marshall, and Co. 1889.)

THIS is a second edition of a work already reviewed in NATURE. The most important point of difference between it and the first edition is the introduction of 100 excellent plates, executed by Angerer and Göschl, of Vienna, from photographs taken from life. Pictures are, no doubt, of great assistance to a description, but, as the author justly observes, photographs, although accurate, fail in some respects to do justice to animals. This he attributes to the awkward positions they assume while standing, and the constancy of their motion while they remain on their limbs. It is also, no doubt, partly due to the higher elevation of the eye of the observer than the camera as usually employed. The levelness of the back and of the belly lines is destroyed by the camera when placed horizontally so as to strike the broadside of the animal. Prominences are shown against the light, which in ordinary observation do not disturb the levelness of the carcass. The work has a strictly pastoral and agricultural interest.

*Days with Industrials; or, Adventures and Experiences among Curious Industries.* By Alexander H. Japp, LL.D. (London: Trübner and Co., 1889.)

THIS book is a reprint, with additions, of a number of articles which have appeared from time to time in various periodicals of a popular character. The articles deal with such subjects as quinine, rice, pearls, amber, common salt, Burton ale and Dublin stout, petroleum, canaries, bedsteads, railway-whistles, knives, forks, and postage-stamps—as heterogeneous a mixture, in fact, as the contents of Mrs. Jellaby's famous cupboard. Dr. Japp writes in a chatty and agreeable style, and his book may be safely given to young people, with the certainty that they will imbibe no false notions of science.

#### LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

#### Lamarck versus Weismann.

I HAD not intended to reply to Mr. Cunningham's criticism of a passage in my book which he thinks is pure Lamarckism (see NATURE, July 25, p. 297); but now that Prof. Ray Lankester adopts the same view, I will make a few remarks upon the case. Mr. Cunningham italicizes the words, "the constant repetition of this effort causes the eye gradually to move round the head till it comes to the upper side," and claims this as a Lamarckian explanation. But if we italicize the following words, which occur three lines further on, "*those usually surviving whose eyes retained more and more of the position into which the young fish tried to twist them,*" we shall see that the survival of favourable variations is, even here, the real cause at work. For the transference of the eye to the upper side was a useful change—perhaps, under the peculiar conditions of existence and development—an absolutely essential one. The amount to which the eye could be twisted and retained in its new position was variable, as all other such characters are variable. Those individuals who had this faculty in the greatest degree were among those that survived, and it is not at all necessary to assume that any portion of the change due solely to the effort was inherited, but only that those individuals which were the most favourably constituted in this respect transmitted their peculiar constitution to their offspring, and thus the twisting would take place earlier and earlier in the development of the individual. Even Darwin himself, who believed in the heredity of acquired variations, says that "the tendency to distortion would no doubt be increased through the principle of inheritance"; and this is really all that is necessary. In most of the higher animals sym-